

November 30, 1889.

ANNIVERSARY MEETING.

Sir G. GABRIEL STOKES, Bart., President, in the Chair.

The Report of the Auditors of the Treasurer's Accounts on the part of the Society was presented, by which it appears that the total receipts on the General Account during the past year, including petty cash balances carried from the preceding year, amounted to £7,433 15s. 9d., and that the total receipts on account of Trust Funds, including a balance of £2,112 6s. 1d. carried from the preceding year, amounted to £4,609 14s. 10d.; and that the total expenditure in the same period, including an overdrawn balance on the General Account of £953 1s. 6d. carried from the preceding year, and including also purchase of stock, amounted to £7,328 16s. 7d. on the General Account, and £2,468 4s. 3d. on account of Trust Funds, leaving a balance on the General Account of £94 7s. 3d. at the bankers' and £10 11s. 11d. in the hands of the Treasurer, and on account of Trust Funds a balance at the bankers' of £2,141 10s. 7d.

The thanks of the Society were voted to the Treasurer and Auditors.

The Secretary then read the following Lists :—

Fellows deceased since the last Anniversary (Nov. 30, 1888).

On the Home List.

Ball, John, F.L.S.	McDonnell, Robert, M.D.
Bate, Charles Spence, F.L.S.	Newall, Robert Stirling, F.R.A.S.
Bateman, John Frederic La Trobe, M.I.C.E.	Parkinson, Rev. Stephen, D.D.
Berkeley, Rev. Miles Joseph, F.L.S.	Percy, John, M.D.
Bristow, Henry William, F.G.S.	Rees, George Owen, M.D.
Brooke, Sir William O'Shaugh- nessey Brooke.	Robinson, Sir Robert Spencer, Admiral, K.C.B.
De la Rue, Warren, D.C.L.	Royston-Pigott, George West, M.D.
Halliwell-Phillipps, James Or- chard, F.S.A.	Tupper, Martin Farquhar, D.C.L.
Joule, James Prescott, D.C.L.	Williams, Charles James Blasius, M.D.

On the Foreign List.

Chevreul, Michel Eugène.		Donders, Franz Cornelius.
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Fellows elected since the last Anniversary.

Aitken, John.	Hughes, Prof. Thomas McKenny,
Ballard, Edward, M.D.	M.A.
Basset, Alfred Barnard, M.A.	Poulton, Edward B., M.A.
Brown, Horace T., F.C.S.	Sollas, Professor William Johnson, D.Sc.
Clark, Latimer, M.I.C.E.	Todd, Charles, M.A.
Cunningham, Professor David Douglas, M.B.	Tomlinson, Herbert, B.A.
Fletcher, Lazarus, M.A.	Worms, Right Hon. Baron Henry de.
Hemsley, William Botting, A.L.S.	
Hudson, Charles Thomas, LL.D.	Yeo, Professor Gerald F., M.D.

The President then addressed the Society as follows:—

IN an annual assembling of any body of men as large as that of our Fellows, it must in the course of nature be expected that of those who were or might have been present on one such occasion some will have been removed by death before the next comes round. But the death-roll of the year, which according to our custom is read by the Senior Secretary at our annual meeting, is on this occasion unusually heavy, and the list recalls to us several who have taken an active part in the ordinary work of the Society, and some whose names will be prominently remembered by posterity.

Warren de la Rue, who has repeatedly served on the Council and Committees of the Society, was one of the early pioneers in the application of photography to the delineation and measurement of celestial objects, an application which has now received such great extension. He was one of the party who went to Spain, in 1860, to observe a total solar eclipse, and he took up the department of observation by photography. His results formed the subject of a Bakerian lecture, and are published in the 'Philosophical Transactions' for 1862. They threw much light on the subject of the solar prominences, then, we may say, in its infancy. He devoted much attention to the subject of Sun-spots, and constructed an elaborate machine for their measurement on photographic negatives under the microscope. Several of our Fellows have had the opportunity of seeing the beautiful experiments on electric discharges in rarefied gases which he carried out by means of his magnificent battery of 15,000 chloride of silver cells, the use of which, with his usual urbanity, he accorded to men of science who might be desirous of investigating some point requiring the aid of so costly an appliance.

Charles James Blasius Williams, who died last March, at a very advanced age, was, with one exception, the senior of our Fellows, having been elected in 1835. For many years one of the most prominent physicians in London, after retirement from medical

practice, in the evening of his days, he took up the examination of solar spots, and their possible relation to meteorology.

Stephen Parkinson was well known to Cambridge men as a mathematician, and was the author of several mathematical works in common use in the University.

John Percy was for more than forty years a Fellow of the Society, and has served on the Council. Many years ago I was myself associated with him at the Government School of Mines, where we both were lecturers together. He was a man of accurate knowledge but of a retiring character, and is perhaps best known to the world through his excellent work on metallurgy, the value of which is evidenced by the fact of its having been translated both into French and German.

Owen Rees, also for more than forty years a Fellow of the Society, did good service in the application of chemistry to the elucidation of disease.

Miles Joseph Berkeley, who died at the advanced age of eighty-six, was distinguished as a cryptogamic botanist; indeed in this branch of botanical science he was long looked up to as the leading authority.

Our late Fellow John Ball was for a long time intimately associated with the work of the Society. Besides serving on the Council, he has very frequently assisted us on various Committees. It will be recollected that he was associated with Sir Joseph Hooker in botanical exploration, and the two, at no little personal risk, ascended the Atlas range on the northern side, being the first Europeans who had penetrated so far. Fond of travel, and of mountain climbing, he was led to take up the subject of botany; and in relation to this science, as well as to meteorology and geology, he turned his travels to good account.

George West Royston-Pigott took up the subject of improvements in the microscope, specially as regards the correction of the residue of spherical aberration, and a paper of his on the subject is printed in the 'Philosophical Transactions.'

John Frederic La Trobe-Bateman, who died in June, will long be remembered for his important engineering works, especially in relation to the supply of water to large towns.

William Henry Bristow was associated with De la Beche, Edward Forbes, and other geologists in the early history of the Geological Survey, and remained in that department of the Civil Service of the country, in which he had been promoted to the post of Senior Director, almost up to the end of his life. He particularly distinguished himself by the careful and detailed manner in which he carried out the mapping of the Cretaceous and Jurassic rocks of the South of England. His maps and descriptions of that region have become classical in English geology. Outside of his official work he

published a few papers giving the results of his researches, and was also the author of a useful glossary of mineralogy, as well as of translations of popular geological works.

On the 21st of April, our late Fellow Robert Stirling Newall passed away at the age of eighty-seven. Mr. Newall, as a successful manufacturer, is well known through the improvements which he effected in the construction of iron rope, which rendered him, we may say, one of the chief founders of an important branch of national industry, and through his success in the construction of those submarine cables which play so important a part in the conveyance of intelligence all over the civilized world. But he did not confine himself to the industrial application of scientific principles; he took a leading step in the development of the refracting telescope. At the time of the Exhibition of 1862, the largest refracting telescope in operation was the 16-inch one at Pulkowa. Messrs. Chance, of Birmingham, placed in that exhibition two disks of optical glass, one of flint and one of crown, of far larger size, about 26 inches in diameter. These Mr. Newall, being possessed of ample means, purchased, with the intention of trying what could be done for astronomical observation by the use of a telescope far larger, of its kind, than had hitherto been used. The construction was confided to Cooke, of York, so well known for the excellence of his optical work. The instrument was erected at Mr. Newall's residence at Gateshead, and is pronounced by competent judges to be of first-rate excellence. The atmospheric conditions of Gateshead were not however favourable for the use of so grand an instrument; and shortly before his death Mr. Newall offered it to the University of Cambridge. This generous offer was referred, as is usual in such cases, to a Committee for report. The Committee have issued a provisional report in which they testify to the excellence of the instrument, and recommend its acceptance; but the final arrangements to be proposed are still under consideration.

By the death of James Prescott Joule, the Society has this year lost one of its Fellows whose name will go down to posterity in connexion with his memorable researches on the mechanical equivalent of heat. The circumstances of his birth would naturally have led him to devote himself to commercial pursuits, but the bent of his mind, animated in early years by the instruction he received from the illustrious Dalton, led him to devote himself mainly to the pursuit of science. As in the case of Faraday, his investigations were carried on without the aid of mathematics, at least of the higher mathematics. But, like Faraday, he seemed to have a sort of intuitive apprehension of physical laws. His early scientific studies led him into the domain of electricity, and its connexion with heat; and he showed that when a voltaic current passes through a conducting wire the heat gene-

rated in a given time varies as the resistance multiplied by the square of the current. It was in connexion with magneto-electricity that his first determination was made of the mechanical equivalent of heat, which was confirmed later by its accordance with the equivalent as determined independently altogether of electricity, by measuring on the one hand the work given out by a descending weight, and on the other the heat generated by internal friction in a liquid in which that work was consumed in overcoming resistance. While much may often be done towards discovering the laws of nature by merely qualitative experiments, the final testing of theories which we may have been led to form involves almost always accurate quantitative determinations. Joule as an experimentalist was accurate in quantitative determinations, and his final number for the mechanical equivalent of heat is accepted as a fundamental constant in thermodynamics.

On account of the great importance of Joule's labours, both directly, in the advancement of science, and indirectly, through the knowledge thus acquired, in enabling improvements to be made in the practical application of science for industrial purposes, it has been suggested that it might be desirable to raise some public memorial to him, and the Council has appointed a Committee to consider the question.

Only yesterday our aged Fellow Martin Tupper passed away, who was the author of works which attained a very wide circulation.

I have referred, and that very briefly, to some only of the Fellows whom we have lost during the past year, but fuller details both of them, of other Fellows whom we have lost, and of our recently deceased foreign members will be found in the obituary notices which appear from time to time in the Proceedings, according as they are received from the Fellows who have kindly undertaken to draw them up.

Of those who last year were on our list of Foreign Members, we have since lost one who was truly a veteran in science. More than three years have elapsed since the celebration of the centenary of the birth of M. Chevreul, and two more recurrences of his birthday came round before he was called away. He will be known for his researches on the contrast of colours. But his great work was that by which he cleared up the constitution of the fixed oils and fats, and established the theory of saponification. Few scientific men still surviving were even born when this important research was commenced—a research in the course of which he laid the foundation of the method now universally followed in the study of organic compounds, by showing that an ultimate analysis by itself alone is quite insufficient, and that it is necessary to study the substances obtained by the action of reagents on that primarily presented for investigation.

Our late Foreign Member Franz Cornelius Donders stood in the first

rank among the men of science of our day. He was educated as an army surgeon; but the bent of his mind led him to scientific investigation, and he became one of the most eminent of physiologists as well as the most distinguished ophthalmologist of his day. He contributed powerfully to the advance, not only of ophthalmology, but also of general physiological science; for on whatever physiological subject he touched he left his mark, bringing as he did to bear on it an acute and original mind, thoroughly trained in physical and chemical principles, and a knowledge of the advances made by the foremost among his scientific contemporaries.

There is one whose name, though he was not a Fellow, I cannot pass by in silence on the present occasion. I refer to Thomas Jodrell Phillips Jodrell, who died early in September, in his eighty-second year. About the time of the publication of the reports of the Duke of Devonshire's Commission, the subject of the endowment of research was much talked of, and Mr. Jodrell placed the sum of £6,000 in the hands of the Society for the purpose of making an experiment to see how far the progress of science might be promoted by enabling persons to engage in research who might not otherwise be in a condition to do so. But before any scheme for the purpose was matured, the Government Grant for the promotion of scientific research was started, under the administration of Lord John Russell, then Prime Minister. This rendered it superfluous to carry out Mr. Jodrell's original intention, but he still left the money in the hands of the Society, directing that, subject to any appropriation of the money that he might make, with the approval of the Royal Society, during his lifetime, the capital should immediately upon his death be incorporated with the Donation Fund, and that in the meantime the income thereof should be received by the Royal Society. Of the capital, £1,000 was several years ago assigned to a fund for the reduction of the annual payments to be made by future Fellows, and the remaining £5,000 has now of course been added to the Wollaston Donation Fund. By the Fee Reduction Fund the annual payment of ordinary Fellows elected subsequently to the time of the change was made £3 instead of £4, and the entrance fee abolished. As to the Donation Fund, a very wide discretion was, by the terms of the original foundation, left in the hands of the Council as to the way in which they should employ it in the interest of science.

Since the Croonian Foundation for lectures was put on its present footing, it has been made the means of securing for us the advantage of a lecture delivered before the Society by distinguished foreign men of science. In the present year our Foreign Member M. Pasteur was invited to deliver the lecture. Unfortunately the state of his health would not allow him to deliver it himself, but at one time he hoped

that he would have been able to be present at its delivery. It was ultimately arranged that his fellow labourer at the Pasteur Institute, Dr. Roux, should deliver the Croonian Lecture in his stead; and several of the Fellows have heard his lucid account, first of the discoveries of M. Pasteur in relation to diseases brought about by microscopic organisms, and then further researches of his own in the same field.

In addressing the Fellows at the anniversary last year, I mentioned that Commandant Desforges had kindly offered to compare that portion of Sir George Schuckburgh's scale, with reference to which the length of the seconds pendulum had been determined by Kater and Sabine, with the French standard mètre; and as the ratio of this to the English standard yard was accurately known, the length of the pendulum, as determined by these accurate observers, would thus for the first time be brought into relation with the English yard by direct comparison with accurately compared measures of length. The comparison was shortly afterwards executed, and the scale, which of course was very carefully packed for its journey to Paris and back, has long since been replaced in the apartments of the Society. This highly desirable comparison occupied but a few days in its execution; which affords one example of the scientific advantages derivable, under an international agreement, from the establishment of the Bureau des Poids et Mesures. Our own country, which for some years held aloof from the Convention, forming the sole exception to the general agreement among nations of importance, joined it some years ago; and we thus have the privilege of availing ourselves as occasion may arise of the appliances at the office in Paris for such comparisons of measures of length or weight.

The services of Mr. Arthur Soper, as a special assistant, have been retained during the past session, with advantage to the library. He has completed the much-needed shelf catalogue, and the rearrangement of the books where necessary. In the course of this work the volumes of a purely literary character have been collected together, and a selection of the most valuable have been preserved in a properly protected case. Of the remainder about 150 volumes (in addition to those reported last year) have been presented to various public libraries, and a slip catalogue of the volumes which are retained, containing about 1,700 entries, has been prepared.

The manuscripts (other than the originals of ordinary papers read at the meetings) which have accrued to the Society since the publication of Mr. Halliwell's Catalogue have been collected from various parts of the building into the Archives Room, with the object of preparing a complete catalogue of the manuscripts at present in the possession of the Society.

Since the last anniversary twenty-four memoirs have been published in the 'Philosophical Transactions,' containing a total of 753 pages and 33 plates. Of the 'Proceedings' twelve numbers have been issued, containing 1062 pages and 6 plates. Dr. R. von Lendenfeld's 'Monograph of the Horny Sponges,' mentioned in my last anniversary address, has also been issued during the year in a quarto volume of 940 pages of text and 51 plates.

The Fellows are aware that for a great many years the Royal Society has devoted a part of its funds to the collection, preparation for the press, and correction of the proofs of a Catalogue of Scientific Papers. We have endeavoured to make the work as complete as possible, and to include scientific serials in all languages. The first part, covering the period 1800 to 1863, is printed in six thick quarto volumes, of which the last appeared in 1872. The decade 1864-1873 occupies two more volumes, of which the second was published in 1879. This work, in the preparation of which the Royal Society has spent a large sum, is for the benefit of the whole civilized world, and the sale of it could not be expected nearly to cover the cost of printing, paper, and binding. On a representation to this effect being made to Government, when the first part was ready for the press, the Lords of the Treasury consented that it should be printed at the public expense, the proceeds of the sale of the work, after reserving a certain number of copies for presentation, being repaid to the Treasury. In consideration of the large outlay involved in the preparation, those Fellows of the Society who wished to purchase the work could do so at about two-thirds of the cost to the general public. A similar application to the Treasury with reference to the decade 1864-1873 met with a similar response, and we proceeded, as I mentioned at the anniversary last year, with the preparation of the manuscript for the next decade, 1874-1883, which was then nearly ready. On making application towards the end of last year to the Treasury for the printing of this decade, our request was not acceded to. While declining, however, to continue any further the printing of this great work, the sum of £1,000 was put in the Estimates, and has since been voted by Parliament, to assist us in the publication, and the copies of the work still remaining unsold have been handed over to us. This has enabled us to conclude negotiations with Messrs. Clay and the Syndics of the Cambridge University Press for the printing of the decade last mentioned, and at the same time to make some provision towards the future continuation of the work, without, as it may be hoped, encroaching to a greater extent than hitherto on our own resources.

The utility of the work would obviously be much increased if it could be furnished with some sort of key enabling persons to find what had been written on particular subjects. I am not without

hopes that this very desirable object may yet be accomplished, notwithstanding the magnitude of any such undertaking.

Within the last year the Council of the Royal Society has accepted a duty in connexion with scientific agriculture, of which it will be interesting to the Fellows to be informed. It is well known that for the last fifty years, or thereabouts, Sir John Lawes has carried out on his estate at Rothamsted an elaborate and most persevering series of experiments on the conditions which influence the growth and yield of crops of various kinds, the effect of manures of different kinds, the result of taking the same crop, year after year, from off the same land without supplying to it any manure, &c. Long as these experiments have already been continued, there are questions, particularly as regards the capabilities of the sub-soil, which require for their satisfactory answers that similar experiments should be continued on the same land for a still longer period. In respect of such questions, the investigator of the science of agriculture is in a position resembling that in which the astronomer is often placed, in having to make observations, the full interest of which it must be left to posterity to enjoy.

To prevent the interruption of these experiments, which it would take a life-time to repeat on fresh ground, and at the same time to provide for the carrying out of researches generally bearing on the science of agriculture, Sir John Lawes has created a trust, securing to the trustees a capital sum of £100,000, and leasing to them for ninety-nine years, at a peppercorn rent, certain lands in his demesne on which the experiments have hitherto been carried on, together with his laboratory. The trust is intended to be for original research, not for the instruction of students. The general direction of the experiments and researches to be carried on is vested in a committee of management consisting of nine persons, of whom four are to be appointed by the President and Council of the Royal Society.

The trustees named in the deed were Sir John Lubbock, Dr. Wells, and our treasurer, Dr. Evans. One of these is now no more. Lord Walsingham has been appointed a trustee in place of the late Dr. Wells.

The Copley Medal for the year has been awarded to Dr. Salmon for his various papers on subjects of pure mathematics, and for the valuable mathematical treatises of which he is the author. Dr. Salmon's published papers are all valuable. Among others may be mentioned his researches on the classification of curves of double curvature, and on the condition for equal roots of an equation; the very important theorem of the constant anharmonic ratio of the four tangents of a cubic curve; his researches on the theory of reciprocal surfaces; his paper on quaternary cubics. But any notice of his contributions to the advancement of pure mathematics would be incom-

plete which did not specially mention his invaluable text-books on conic sections, higher plane curves, solid geometry, and the modern algebra—works which not only give a comprehensive view of the subjects to which they relate, but contain a great deal of original matter.

Of the Royal Medals, it is the usual though not invariable practice to award one for mathematics or physics, including chemistry, and one for some one or more of the biological sciences. No distinction is, however, made between the two medals in point of order of precedence, and I will, therefore, take the names of the medallists in alphabetical order.

The Council have awarded one of the Royal Medals this year to Dr. Walter Holbrook Gaskell for his researches in cardiac physiology, and his important discoveries in the anatomy and physiology of the sympathetic nervous system.

In his memoir, "On the Rhythm of the Heart of the Frog" (Croonian Lecture, 'Phil. Trans.', 1882), and in a subsequent memoir, "On the Innervation of the Heart of the Tortoise" ('Journ. of Physiol.', vol. 4), Dr. Gaskell very largely advanced our knowledge of the physiology of the heart-beat, more especially as relates to the sequence of the beats of the several parts, the nature of the inhibitory action of the vagus nerve, and the relations of tonicity and conducting power to rhythmical contraction. These memoirs, however, lacked completeness on account of their not taking into full consideration the action of the cardiac augmentor or accelerator fibres, the existence of which had been previously indicated in the case of mammals, and suspected in the case of the frog and allied animals.

By a striking experiment ('Journ. of Physiol.', vol. 5) Dr. Gaskell subsequently gave the first clear demonstration of the presence in the frog of cardiac augmentor fibres; also he gave a clear account of the nature of the action of these fibres, and the relations of that action to the action of the vagus fibres. Revising his previous work by the help of the light thus gained, Dr. Gaskell was enabled to give the first really consistent and satisfactory account of the nature of the heart-beat, of the modifications of beat due to extrinsic nerves, and of the parts played by muscular and nervous elements respectively.

Important as was this work on the heart, Dr. Gaskell's subsequent work "On the Structure, Functions, and Distribution of the Nerves which govern the Vascular and Visceral Systems" ('Journ. of Physiol.', vol. 7) has a far higher importance and significance. In spite of the knowledge which during the past thirty or forty years has been gained concerning vaso-motor nerves and the nerves governing the movements of the viscera, physiologists had up to the time of the appearance of Dr. Gaskell's memoir failed to obtain a clear conception

of the nature and relations of the so-called sympathetic nervous system. By his researches, in which the several methods of gross anatomical investigation, minute histological examination, and experimental inquiry were, in a striking manner, made to assist each other, Dr. Gaskell, by tracing out the course and determining the nature of vaso-constrictor and vaso-dilator fibres, and comparing them with the cardiac augmentor and inhibitory fibres, and with the fibres governing the visceral muscles, has already reduced to order what previously was to a large extent confusion, and has opened up what promises to be the way to a complete understanding of the whole subject.

The results arrived at, besides their great physiological importance, on the one hand promise to be of great assistance in practical medicine, and on the other are eminently suggestive from a purely morphological point of view.

The other Royal Medal has been awarded to Professor Thomas Edward Thorpe for his researches on fluorine compounds, and his determination of the atomic weights of titanium and gold.

Professor Thomas Edward Thorpe's experimental work has secured for him a place in the first rank of living experimentalists.

His researches, which are not confined to one department of chemical science, but extend over many branches, are all distinguished, both by accuracy and originality of treatment. As examples of the high character of his investigations those of the determinations of the atomic weights of titanium and gold may be specially cited as permanently settling the value of two most important chemical constants; whilst his researches on the fluorine compounds, including the discovery of thiophosphoryl fluoride, a body capable of existing undecomposed in the state of gas, and his latest work on the Vapour-density of Hydrofluoric Acid, do not fall short of the highest examples of classical chemical investigation.

The Davy Medal has been awarded to Dr. W. H. Perkin for his researches on magnetic rotation in relation to chemical constitution.

Dr. Perkin is well known as the originator of what is now a great industry, that of the coal-tar colours, by his preparation and application to tinctorial purposes of a colouring matter which had previously merely been noticed as affording a chemical test for the presence of aniline. This, however, is now a long time ago, and it is for more recent work, the interest of which is purely scientific, that the medal has been awarded to him.

Dr. Perkin first showed, in 1834, that a definite relationship exists between the chemical constitution of substances and their power of rotating the plane of polarisation of light when under magnetic influence; and he pointed out how the "molecular coefficient of magnetic rotation" or "molecular rotatory power" might be deduced.

In 1884 he presented to the Chemical Society a lengthy paper describing his method and the results obtained for a very large number of paraffinoid hydrocarbons and haloid and oxygenated derivatives thereof; from these he deduced "constants," which he has since shown to be applicable in calculating the magnetic rotatory power of paraffinoid compounds generally. From time to time he has published further instalments of his work, and only quite recently has described the results obtained on examining nitrogen compounds, which exhibit many most interesting peculiarities.

The results are of special value on account of the exceptional care devoted to the preparation of pure substances, and the guarantee which Dr. Perkin's reputation affords, that everything possible has been done to secure accuracy; and also because the substances chosen are for the most part typical substances, or belong to series in which a simple relationship exists.

The Statutes relating to the election of Council and Officers were then read, and Sir W. Aitken and Professor H. G. Seeley having been, with the consent of the Society, nominated Scrutators, the votes of the Fellows present were taken, and the following were declared duly elected as Council and Officers for the ensuing year:—

President.—Sir George Gabriel Stokes, Bart., M.A., D.C.L., LL.D.

Treasurer.—John Evans, D.C.L., LL.D.

Secretaries.—{ Professor Michael Foster, M.A., M.D.
The Lord Rayleigh, M.A., D.C.L.

Foreign Secretary.—Archibald Geikie, LL.D.

Other Members of the Council.

Professor Henry Edward Armstrong, Ph.D.; Professor William Edward Ayrton; Charles Baron Clarke, M.A.; Professor W. Boyd Dawkins, M.A.; Edward Emanuel Klein, M.D.; Professor E. Ray Lankester, M.A.; Hugo Müller, Ph.D.; Professor Alfred Newton, M.A.; Captain Andrew Noble, C.B.; Rev. Stephen Joseph Perry, D.Sc.; Sir Henry E. Roscoe, D.C.L.; Edward John Routh, D.Sc.; William Scovell Savory; Professor Joseph John Thomson, M.A.; Professor Alexander William Williamson, LL.D.; Sir Charles William Wilson, Col. R.E.

The thanks of the Society were given to the Scrutators.

[Nov. 30,

Balance Sheet. 1889.

Statement of Receipts and Expenditure from November 12th, 1888, to November 12th, 1889.

	£ s. d.	£ s. d.	£ s. d.
To Balance in hand, Catalogue Account	14 1 7	22 2 11	953 1 6
" Petty Cash	8 1 4		1,726 3 4
" Annual Contributions, £8 at £4.....	632 0 0	1,052 0 0	166 14 0
" " 140 at £3.....	420 0 0	10 0 0	319 18 11
" Admission Fees.....			
" Fee Reduction Fund, in lieu of Admission Fees and Annual Contributions.....	290 0 0		476 6 7
" Rents:			
Fee Farm, Lewes.....	18 14 5	Ditto Proceedings, Nos. 271 to 279 ...	432 6 4
Mablethorpe Estate.....	88 4 0	Ditto Miscellaneous.....	137 17 6
Ground Rents.....		Paper for Transactions and Proceedings.....	2,025 5 7
" Dividends (exclusive of Trust Funds).....		Binding ditto	248 12 4
" do. Jodrell Fund.....	1,916 19 4	" Engraving and Lithography	43 2 0
" " Interest on Mortgage Loan.....	133 13 11	Soiree and Reception Expenses	687 0 10
" Sale of Transactions and Proceedings	585 0 0	Coal, Lighting, &c.	137 7 6
" Treasury Grant on account of Catalogue	677 11 6	Office Expenses	231 12 2
" Sale of Catalogue.....	1,009 0 0	House Expenses	48 12 7
" Sale of Krakatoa Report (leaving £100 12s. 3d. Expenditure in excess of Receipts)	188 6 6	Tea Expenses	119 14 7
" Transfer from Handley Fund on account of Catalogue	416 4 10	Fire Insurance	15 12 2
" Compositions	87 2 4	Taxes	56 15 0
" Eclipse Expedition—Government Grant of Balance	120 0 0	Advertising	44 12 6
" Linail	207 11 7	Postage, Parcels, and Petty Charges	20 0 6
" Sale of Londenfeld Monograph	4 12 0	Miscellaneous Expenses	63 3 0
	6 0 0	" Law Charges	42 16 8
		" Lendenfeld Monograph (making with previous Expenditure £582 2s. 7d.)	5 0 8
		" Atlas Company Household Assurance on Account of Catalogue.....	585 13 5
		" Carrington Donation	74 2 6
		" Balance at Bankers	22 10 0
		" Balance on hand, Catalogue Account £2 17 7	94 7 3
		" Ditto, Petty Cash	7 14 4 } 10 11 11
			£7,433 15 9

Trust Funds.

To	Balance at Bank 12th November, 1889:—	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
General Account	1,463 14 1						
Fee Reduction Fund Account	296 11 2						
Scientific Relief Fund Account	352 0 10						
Scientific Relief Fund, Dividends, and Donations.....	646 12 6						
Donation Fund, Dividends, and Trans- fer from Jodrell Fund	262 3 9						
” Rumford Fund, Dividends	65 2 2						
” Birkonian and Copley Medal Fund, Dividends, &c.	56 10 8						
Keck Bequest, Dividends	23 8 0						
” Winttingham Fund, Dividends, &c.	33 13 0						
” Croonian Lecture Fund—Rent	50 9 8						
” Davy Medal Fund, Dividends	32 3 6						
” Gassiot Trust, Dividends	187 2 4						
” Handley Fund, Payments	187 2 4						
” Jodrell Fund, Transfer to Royal Society General Account and to Do- nation Fund	145 5 6						
” Handley Fund, Investment and transfer to Royal Society General Account (1889)	512 5 0						
” Darwin Memorial Fund, Expenses and Investment	282 12 0						
” Balance at Bankers:—							
General Account	1,171 18 7						
Fee Reduction Fund Account	198 18 8						
Scientific Relief Fund Account	770 13 4						
	£4,609 14 10						

Estates and Property of the Royal Society, including Trust Funds.

Estate at Mablethorpe, Lincolnshire (55*l.* 2*r.* 2*p.*), rent £100 per annum.

Ground Rent of House No. 57, Basinghall Street, rent £380 per annum.

” of 23 houses in Wharton Road, West Kensington, rents £253 per annum.

Fee Farm Rent, near Lewes, Sussex, £19 4*s.* per annum.

One fifth of the clear rent of an estate at Lambeth Hill, from the College of Physicians, about £52 per annum, Croonian Lecture Fund.

Stevenson Bequest, Chancery Dividend. One-fourth annual interest on Government Annuities and Bank Stock £15,000 (produced £544 5*s.* 8*d.* in 1888-89).

£15,000 Mortgage Loan, 4 per Cent.

£10,772 7*s.* 2*d.* on account of the following Funds:—

	£	s.	d.
Rumford Fund	2,322	19	0
Winstanley Fund	1,200	0	0
Gassiot Trust	400	0	0
Sir J. Copley Fund	1,616	13	4
Jodrell Fund	5,182	14	10
and £3,452 1 <i>s.</i> 1 <i>d.</i> in Chancery, arising from sale of the Coleman Street Estate.—General Purposes.			

£403 9*s.* 8*d.* New 2*½* per Cent. Stock.—Bakerian and Copley Medal Fund.

£1,000 India 3*½* per Cent. Stock.—General Purposes.

£600 Midland Railway 4 per Cent. Debenture Stock.—Keck Bequest.

£5,660 Madras Railway Guaranteed 5 per Cent. Stock { General Purposes, £5,000. Davy Medal Fund, £360.

£10,000 Italian Irrigation Bonds.—The Gassiot Trust.

£6,396 Great Northern Railway 4 per Cent. Debenture Stock { Scientific Relief Fund, £5,000. The Trevelyan Bequest, £1,396.

£4,200 Metropolitan 3½ per Cent. Stock.—Fee Reduction Fund.	
£7,000 London and North Western Railway 4 per Cent. Perpetual Debenture Stock.—Fee Reduction Fund.	
£18,150 " " " 4 per Cent. Consolidated Guaranteed Stock.—£6,000 Scientific Relief Fund. £5,000 North Eastern Railway 4 per Cent. Preference Stock.—General Purposes.	£12,150 General Purposes.
£5,000 London and North Western Railway Consolidated 4 per Cent. Preference Stock.—General Purposes.	
£2,200 South Eastern Railway 4 per Cent. Debenture Stock.—Darwin Memorial Fund.	
£4,340 South Eastern Railway 5 per Cent. Debenture Stock.—Scientific Relief Fund.	
£3,333 London and South Western Railway 4 per Cent. Preference Stock.—General Purposes.	
£5,030 Great Northern Railway Perpetual 4 per Cent. Guaranteed Stock.—Donation Fund.	
£4,798 Lancashire and Yorkshire Railway 4 per Cent. Guaranteed Stock.—Handley Fund.	
£1,000 Policy in the Atlas Assurance Office, becoming due October 7th, 1899.—Catalogue Account.	

JOHN EVANS, *Treasurer.*

We, the Auditors of the Treasurer's Accounts on the part of the Society, have examined these Accounts and found them correct.

WILLIAM POLE.
ARTHUR W. RÜCKER.

A. R. CLARKE.
JAMES COCKLE.
JOHN RAE.

[Nov. 30,

Trust Funds. 1889.

Scientific Relief Fund.

£86,000 L. & N.W.R. 4 per Cent. Consolidated Guaranteed Stock.
£55,000 Great Northern Railway 4 per Cent. Debenture Stock.
£4,340 South Eastern Railway 5 per Cent. Debenture Stock.

Dr.	Cr.
To Balance $\left\{ \begin{array}{l} \text{Income} \\ \text{Less — Capital over-invested} \end{array} \right.$	£ 388 13 1
" Dividends	36 12 3
" Annual Subscriptions .....	.....
	£998 13 4
By Grants .....	.....
	£ 228 0 0
Balance in hand, Income	£801 4 7
" Less — Capital over-invested	30 11 3
	770 13 4
	£998 13 4

Donation Fund.

£5,030 Great Northern Railway Perpetual 4 per Cent. Guaranteed Stock.
£1,396 Great Northern Railway 4 per Cent. Debenture Stock.
The Trevelyan Bequest.

	£	s.	d.	£	s.	d.	
To Balance	532	5	2	By Grants	243	18	0
" Dividends	260	12	2	" Balance	550	10	11
" Transfer from Jodrell Fund	11	11	7				
	£794	8	11				

Rumford Fund.

£2,322 19s. 2 $\frac{3}{4}$ per Cent. Consolidated Stock.		
	£	s. d.
To Balance	158	10 9
,, Dividends	65	2 2
	<u>£223</u>	<u>12 11</u>

Bakerian and Copley Medal Fund.

Sir Joseph Copley's Gift, £1,666 13s. 4d. 2 $\frac{3}{4}$ per Cent. Consolidated Stock.
£403 9s. 8d. New 2 $\frac{1}{2}$ per Cent. Stock.

To Balance		
	£	s. d.
" Balance	121	5 10
" Dividends, New 2 $\frac{1}{2}$ per Cent. Stock	9	16 8
" Dividend—Sir J. Copley's Fund	46	14 0
	<u>£177</u>	<u>16 6</u>
By Gold Medal	4	12 0
" Professor T. H. Huxley—Sir J. Copley's Gift	50	0 0
" Professors Ricker and Thorpe—Bakerian Lecture	4	0 0
" Balance	119	4 6
	<u>£177</u>	<u>16 6</u>

The Keek Beguest.

£600 Midland Railway 4 per Cent. Debenture Stock.		
	£	s. d.
To Dividends	23	8 0
	<u>23</u>	<u>8 0</u>
By Payment to Foreign Secretary	23	8 0
	<u>23</u>	<u>8 0</u>

[Nov. 30,

Wintringham Fund.£1,200 2*½* per Cent. Consolidated Stock.

	£ s. d.	£ s. d.
To Balance	46 15 3	By Payment to Foundling Hospital.....
, Dividends	33 13 0	, Balance
	<hr/>	<hr/>
	£80 8 3	£80 8 3
	<hr/>	<hr/>

Croonian Lecture Fund.

One-fifth of the clear rent of an Estate at Lambeth Hill, from the College of Physicians, about £62 per annum.

	£ s. d.	£ s. d.
To Rent	50 9 8	By Balance at November 1888
, , Lecture—Professor Kühne.....	.	, , Lecture—Professor Kühne
	<hr/>	<hr/>
	£50 9 8	£50 9 8
	<hr/>	<hr/>

Davy Medal Fund.

	£ s. d.	£ s. d.
To Balance	77 1 1	By Gold Medals
, Dividends	32 3 6	, Balance
	<hr/>	<hr/>
	£109 4 7	£109 4 7
	<hr/>	<hr/>

The Gassiot Trust.

£10,000 Italian Tessicottura Bond

THE HOUSE BILL.

£400 2 <i>½</i> per Cent. Consolidated Stock.			
	£ s. d.	£ s. d.	£ s. d.
To Balance	52 0 6		By Payments to Kew Committee.....
, Dividends	498 7 2		Purchase of £50 2 <i>½</i> per Cent. Consolidated Stock
			" Balance
			487 10 0
			48 8 9
			14 8 11
			£550 7 8

Handlen Funder

1 mm Count Dimensional Stock

	To Dividends	£	s.	d.	£	s.	d.	
£2,170 Lancashire and Yorkshire Railway - per Cent. Committee Acc.		187	2	4	By Institut Pasteur	100	0	0
					” Transfer to Catalogue Account	87	2	4
						£187	2	4

The Tadpoles' Friend

±100 nm, 300 ± 100 nm

£1,182 14s. 10d. 2 <i>½</i> per Cent. Consol. due, Stocks,	
Dividends	£ s. d.
145 5 6	
By Transfer to Royal Society General Account.....	133 13 11
" " " Donation Fund—Proportion of Divi- dends since 3rd September.....	11 11 7
	£145 5 6
	£145 5 6

[Nov. 30,

Fee Reduction Fund.

£4,200 Metropolitan 3½ per Cent. Stock.

£7,000 London and North Western Railway 4 per Cent. Perpetual Debenture Stock.

	£ s. d.		£ s. d.
To Balance	296 11 2	By Transfer to Royal Society General Account.....	290 0 0
," Dividends	414 12 6	," Purchase of £200 Metropolitan 3½ per Cent. Stock	222 5 0
		," Balance	198 18 8
	<hr/> <hr/> <hr/> <hr/> <hr/>		<hr/> <hr/> <hr/> <hr/> <hr/>
	£711 3 8		£711 3 8

Darwin Memorial Fund.

£2,200 South Eastern Railway 4 per Cent. Debenture Stock.

	£ s. d.		£ s. d.
To Balance { Capital, £249 1 8	481 11 6	By Printing and Engraving	22 15 6
Income, £232 9 10	81 18 0	," Purchase of £200 S.E.R. 4 per Cent. Debenture Stock	259 16 6
" Dividends		," Balance, Income	£291 12 4 }
		Less Capital over-invested... £10 14 10 }	280 17 6
	<hr/> <hr/> <hr/> <hr/> <hr/>		<hr/> <hr/> <hr/> <hr/> <hr/>
	£563 9 6		£563 9 6

The following Table shows the progress and present state of the Society with respect to the number of Fellows:—

	Patron and Royal.	Foreign.	Com-pounders.	£4 yearly.	£3 yearly.	Total.
Nov. 30, 1888 ..	5	49	182	160	127	523
Since Elected ..	..	..	+ 2	+ 1	+ 13	+ 16
Since Deceased ..	..	— 2	— 8	— 10	— 1	— 21
Nov. 30, 1889 ..	5	47	176	151	139	518

Account of the appropriation of the sum of £4,000 (the Government Grant) annually voted by Parliament to the Royal Society, to be employed in aiding the advancement of Science (continued from Vol. XLV, p. 69).

1888-89.

	£
Dr. R. Stockman and D. B. Dott, for a Research into the Chemical Properties and Physiological Action of Bodies derived from some Alkaloids by Substitution or Decomposition	25
J. V. Jones, for the Measurement of an Electrical Resistance in Absolute Measure by the method of Lorenz	50
A. P. Laurie, for a Research on the Properties of Alloys tested in Voltaic Cells, and replacing the Zinc Plate therein..	20
F. R. Japp, for an Investigation of the Reactions of Ketones, Diketones, and Allied Compounds	75
A. M. Worthington, for an Investigation into the Tensile Strength of Liquids at different Temperatures, and into the Relation between Stress and Strain in a Stretched Liquid....	20
Hon. R. Abercromby, for the Investigation of British Thunderstorms	25
A. R. Ling, for the Study of the Halogen Derivatives of Quinones.....	30
G. T. Moody, for the Investigation of Isomeric Xylene Derivatives.....	25
G. J. Symons, for completing the Collection of British Rain-fall Records for the 17th and 18th Centuries	50
Carried forward.....	£320

	£	s.	d.
Brought forward	320	0	0
C. I. Burton, for a Research on the Heat produced by Compressing Solids and Liquids	50	0	0
J. A. Ewing, for Researches on the Magnetic Qualities of Iron and other Magnetic Metals.....	50	0	0
T. Carnelley and A. Thompson, for an Investigation of the Relation of Solubility to Fusibility, more particularly in the case of Isomeric Organic Compounds	25	0	0
H. R. Mill, for completion of the Discussion of Observations on the Temperature of the Water in the Clyde Sea Area and the Sea-lochs of the West of Scotland	25	0	0
S. Skinner, for continuation of Researches upon the Substances produced by the Action of Phenylhydrazine on Urea Derivatives	30	0	0
J. T. Bottomley, for continuation of Research on Radiation of Heat	100	0	0
A Committee of the Royal Society. Balance of Expenses of the Solar Eclipse (1886) Expedition.....	207	11	7
G. S. Brady and A. M. Norman, for expense of Plates to a Memoir on the European and North Atlantic Ostracoda.....	50	0	0
L. C. Wooldridge, for further Research on a New Mode of Protection against Zymotic Disease	100	0	0
Liverpool Marine Biological Committee, for the continued Scientific Exploration of the L.M.B.C. District, Liverpool Bay, and to aid Mr. I. C. Thompson in his Research on the Surface Fauna, and especially the Copepoda	50	0	0
T. Johnson, for the Investigation of a Number of Obscure or Unknown Points in the Florideæ.....	30	0	0
H. G. Seeley, for an Investigation of the Permian or Trias Reptilia in Russia in Europe, and Cape Colony....	200	0	0
G. Massee, to complete a Monograph of the Fungi belonging to the order Thelephorei.....	50	0	0
O. J. Lodge, for Apparatus to be used in an Investigation into the Discharge of Condensers, and the Phenomena attending Sparks	25	0	0
J. Joly, for a Research on the Specific Heats of Gases at Constant Volume	60	0	0
S. P. Thompson, for the construction of an Instrument to determine with precision the Focal Planes and Principal Planes of Optical Combinations of Lenses having a Short Focus	35	0	0
Carried forward.....	<hr/>	£1,407	11
		7	

	£ s. d.
Brought forward.....	1,407 11 7
W. J. Dibdin, for a Research on Stellar Photometry, especially the Determination of the Luminous Energy of the Coloured Stars.....	100 0 0
Royal Astronomical Society, for sending Observers to Cayenne and Autigas Factories (South Africa), to make Observations, especially Photographic, of the Total Solar Eclipse of December 21-22, 1889	400 0 0
A. A. Common, for payment of an Assistant in applying his 5-foot Telescope to Astronomical Photography....	150 0 0
J. A. Fleming, to test a proposed method of constructing a Standard Air Condenser, to be available for the Comparison of the Mica and Paraffin Condensers used in Telegraph work	50 0 0
J. N. Lockyer, for payment of an Assistant to carry on Spectroscopic Observations	125 0 0
N. Collie, for a Research on (1) the Action of HCl on the Amide of Acetoacetic Ether, &c.; (2) the Constitution of some Oxypyridine Derivatives.....	25 0 0
S. E. Linder and H. Picton, for a Research into the Formation and Properties of Metallic Hydrosulphides, &c.	30 0 0
J. E. Reynolds, for continuation of Researches on Silicon Compounds	60 0 0
W. R. Dunstan, for a Research on the Connection between Chemical Constitution and Physiological Action as exhibited by some of the Homologous and Metameric Nitrites of the Paraffin Series.....	75 0 0
W. R. Dunstan, for further Aid in an Examination of the Reduction Products of the Nitro-paraffins	20 0 0
Dr. C. R. Alder Wright, for Aid in continuing Researches on Ternary Alloys	100 0 0
G. J. Symons, for a Research on the Temperature of Hot Springs in the Pyrenees	50 0 0
C. Lapworth, for continuing a Research among the Lower Palaeozoic Rocks and Fossils of Britain	100 0 0
West Indies Committee, for further Aid in collecting Fauna and Flora in the less known West India Islands ..	100 0 0
China Floral Committee, for continuing the Investigation of the Flora of China.....	300 0 0
G. H. Fowler, for a Research on Problems connected with the Physiology and Binomies of the Lesser Crustacea	150 0 0
Carried forward	<hr/> £3,242 11 7

	£ s. d.
Brought forward	3,242 11 7
E. R. Lankester, for obtaining Embryos of <i>Amphioxus</i> , and for the payment of an Assistant in studying the same	100 0 0
W. D. Halliburton, for continuation of Researches in Physiological Chemistry	50 0 0
V. Horsley (with Messrs. Beevor, Spencer, Dean, and Gotch), for Researches into the Functions of the Central Nervous System.....	150 0 0
J. R. Bradford, for a Research into the Nature of Secretion, more especially the Nature of Secreting Nerves....	50 0 0
E. A. Schäfer, for a Research into the Functions of certain parts of the Central Nervous System.....	100 0 0
Dr. T. L. Brunton, for Materials and Assistants for a Research on the Connection between Chemical Constitution and Physiological Action	200 0 0
J. A. McWilliam, for a further Investigation into the Innervation of the Mammalian Heart	30 0 0
J. Gnezda, a loan of Instruments.	
A. Lingard, for continuing Investigations into the Protection against Infectious Diseases, more especially Anthrax and Tuberclie, from the point of view of the relation existing between the Fœtus and its Mother	40 0 0
W. F. Denning, for the Observation, and discussion of Observations, of Shooting Stars, with particular reference to Stationary Radiant Points	20 0 0
S. U. Pickering, for a further Investigation on the Nature of Solutions	50 0 0
P. Frankland, to continue Investigations on the Chemical Changes effected by Specific Micro-organisms..	50 0 0
C. A. Ballance and S. Shattock, for further Research on the Pathology of Cancer	50 0 0
Piazzi Smyth, to obtain Ultra Definition and Extreme Separation in Luminous Spectroscopy	50 0 0
C. S. Sherrington, to assist in his Researches on the Nervous System.....	50 0 0
Scottish Meteorological Society, for Aid in a systematic Observation at Ben Nevis Observatory of the number of Dust Particles in the Atmosphere	50 0 0

£4,282 11 7

<i>Dr.</i>	<i>£ s. d.</i>	<i>Cr.</i>
To Balance, November 30, 1888.	209 19 11	By Appropriations, as
„ Grant from Treasury	4,000 0 0	above..... 4,282 11 7
„ Repayments	210 0 0	Salaries, Printing,
„ Interest on Deposit	37 6 1	Postage, Advertising, and other Administrative Expenses..... 113 12 1
		By Balance, Nov. 30,
		1889 61 2 4
	<u>£4,457 6 0</u>	<u>£4,457 6 0</u>

Account of Grants from the Donation Fund in 1888-89.

	<i>£ s. d.</i>
Prof. T. R. Jones, for illustrations of his work on the Fossil Astracoda, £25. On account	18 18 0
Prof. W. N. Parker, to assist in Researches on <i>Protopterus annectens</i>	25 0 0
Prof. Schäfer, to assist in Researches on the Functions of certain parts of the Brain	25 0 0
Dr. J. Rose Bradford, to assist in his Researches on the Vaso-motor Nerves of the Lungs and the Kidneys	25 0 0
Prof. D'Arcy Thompson, to assist in purchasing specimens of Natural History through Dundee Whalers.....	35 0 0
Dr. Geikie, to assist the Rev. R. Baron in his Geological Researches in Madagascar	20 0 0
Sir J. D. Hooker, for payment of an Artist to assist in illustrating a Monograph of the Indian Orchids	50 0 0
Prof. W. K. Parker, to assist in Researches on the Morphology of the Vertebrata	25 0 0
W. de la Rue, for the completing of his Catalogue of Latitude and Longitude of Solar Spots, £200. On account	20 0 0
	<u>£243 18 0</u>